GVIS – Gee Whiz – WOW: Human Computer Interfaces
Creating New Opportunities

What if you could...

- Explore your results more easily and fully?
- Detect patterns including potential errors in data?
- Analyze and collaborate on larger data sets?
- Explain your results to others in a more engaging, exciting way?
- Create models in a more natural way?
Convergence of new technologies

- Stereo displays
- Powerful GPUs
- Tiled displays
- Immersive Environments
- Multi-touch surfaces
- Natural user interfaces
- Augmented Reality
- Mobile devices
- 3D printing
- 3D capture devices

Agenda

- Benefits of visualization
- Current visualization and natural user interface technologies
- Visualization and natural user interfaces at GRC
- Next steps
- Try out the demos
Visualization: key to discovery & understanding

Bandwidths of human senses

Infographic created by David McCandless based on data from Tor Norretranders
Why visualization matters

- Enhance working memory
- Detect patterns
- Abstract problems
- Build things we can’t build
- See things we can’t see
- Go to places we can’t go

Stereoscopic Displays
Use BOTH your eyes
Stereoscopic Displays
Oculus Rift at GRC

Visualization and Interactive Displays at GRC
GVIS Portable 3D Displays for Interactive Simulations
CAVEs
Become immersed in your data

http://www.evl.uic.edu/core.php?mod=4&type=1&indi=424

Visualization and Interactive Displays at GRC
GRUVE Lab - 3D Immersive visualization environment (CAVE)

http://www.youtube.com/watch?v=G5YBR7Kmg8c&
Tiled Displays
The big picture and the details

Projection Augmented Reality Displays
Put imagery and information where you need it

http://www.youtube.com/watch?v=C1gV928YPTQ#t=10s
Augmented Reality
Real world – only better

https://www.youtube.com/watch?v=gZxK6j4JTHQ#t=26
Visualization and Natural User Interfaces at GRC

Educational Augmented Reality – Imaging Technology Center

Visualization and Natural User Interfaces at GRC

SLOPE’s Augmented Reality Sandbox
Natural user interfaces (NUI)

Right now, we interact with computers in a very unnatural 2D way.

With the Leap Motion Controller, “you can really apply your intuition and take something from your mind to a physical object with far greater ease than we currently do.”

— Elon Musk

http://www.youtube.com/watch?v=xNqs_S-2EBY

Evolution of user interfaces

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<th>Command Line Interface (CLI)</th>
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<td>Large cognitive load</td>
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<td>Intuitive</td>
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Natural User Interfaces (NUI)

- Similar to how we interact with real world
- Frees brain for cognition, creativity and exploration
- Over time becomes invisible to the user

Multi touch displays

Provides a fast and intuitive interface

http://sciencenordic.com/gigantic-multitouch-displays-become-microscopes
Multi touch displays
Provides a fast and intuitive interface

http://vimeo.com/33046498

Visualization and Natural User Interfaces at GRC
55” PixelSense Display
Multi-surface, natural user interface displays
Seamless sharing of data across devices

http://www.youtube.com/watch?v=fcMhZ9J0qN8#t=34m
Natural user interface input devices at GRC
Leap Motion and Kinect

Tangible interfaces
Manipulatable digital information with your hands
Latest 3D and NUI devices

CastAR

http://technicalillusions.com/

Latest 3D and NUI devices

zSpace
Latest 3D and NUI devices
SpaceGlasses

https://www.youtube.com/watch?v=b7I7JuQXttw#t=12s

Interactive, immersive design environments
Virtual Interactive Aerodynamic Design Environment
Rolls Royce

3D Scanners
Industrial and for your iPad


NextEngine 3D scanner

• Applications:
  • Scan biological/abstract forms for simulation
  • Create models of old hardware
  • Reverse engineering
  • Scan and 3D print expensive parts
3D printers

Next steps

- GRC experts
- Advanced Visualization
- Your ideas
- Advanced human computer interaction devices

Innovation
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• Eric Mindek
• Vikram Shyam
Backup Slides
NextEngine 3D scanner

- Takes multiple laser scans of object while object is rotated through 360 degrees.
- Multiple orientations are used.
- Scanning software stitches together images based on common reference markers.
- Depends on lighting, proximity, object emissivity etc.
- Can save to CAD files for manipulation.

Applications:
- Scan biological/abstract forms for simulation.
- Create models of old hardware.
- Reverse engineering.
- Scan and 3D print expensive parts.

Natural user interface input devices

Leap Motion with CAD

http://www.youtube.com/watch?v=qjSWTpV1vLh#t=105s
2013 Gartner Hype Cycle for Emerging Technologies

http://www.gartner.com/newsroom/id/2575515
Confirmation
- when you have a known hypothesis to test, and you want to produce a picture to test whether it is correct...

Exploration
- interactivity is important when you have a new, perhaps complex, dataset that can be viewed in many different ways - especially if you’re not even sure yet what questions you need to ask of the data.
Importance of Visualization

- Hal Varian, Google, “The ability to take data—to be able to understand it, to process it, to extract value from it, to visualize it, to communicate it—that’s going to be a hugely important skill in the next decades”
- “Some scientists still think that good data visualization is only necessary when presenting work to "the public". In truth, thinking hard about how to learn the most from any data set should always involve some form of graph, map, chart, or other visual statistical display”

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